

**2. Benefit of Prior U.S. Application(s) (35 U.S.C. 120)**

**NOTE:** If the new application being transmitted is a divisional, continuation or a continuation-in-part of a parent case, or where the parent case is an International Application which designated the U.S., then check the following item and complete and attach **ADDED PAGES FOR NEW APPLICATION TRANSMITTAL WHERE BENEFIT OF PRIOR U.S. APPLICATION(S) CLAIMED.**

- ☐ The new application being transmitted claims the benefit of prior U.S. application(s) and enclosed are **ADDED PAGES FOR NEW APPLICATION TRANSMITTAL WHERE BENEFIT OF PRIOR U.S. APPLICATION(S) CLAIMED.**

**3. Papers Enclosed Which Are Required For Filing Date Under 37 CFR 1.53(b) (Regular) or 37 CFR 1.153 (Design) Application**

17 Pages of specification  
2 Pages of claims  
1 Pages of Abstract  
3 Sheets of drawing

- ☐ formal  
☒ informal

**WARNING:** *DO NOT* submit original drawings. A high quality copy of the drawings should be supplied when filing a patent application. The drawings that are submitted to the Office must be on strong, white, smooth, and non-shiny paper and meet the standards according to § 1.84. If corrections to the drawings are necessary, they should be made to the original drawing and a high-quality copy of the corrected original drawing then submitted to the Office. Only one copy is required or desired. Comments on proposed new 37 CFR 1.84. Notice of March 9, 1988 (1990 O.G. 57-62).

**NOTE:** "Identifying indicia, if provided, should include the application number or the title of the invention, inventor's name, docket number (if any), and the name and telephone number of a person to call if the Office is unable to match the drawings to the proper application. This information should be placed on the back of each sheet of drawing a minimum distance of 1.5 cm. (5/8 inch) down from the top of the page." 37 C.F.R. 1.84(c)).

(complete the following, if applicable)

- ☐ The enclosed drawing(s) are photograph(s), and there is also attached a "PETITION TO ACCEPT PHOTOGRAPH(S) AS DRAWING(S)". 37 C.F.R. 1.84(b).

**4. Additional papers enclosed**

- ☐ Preliminary Amendment  
☐ Information Disclosure Statement (37 CFR 1.98)  
☐ Form PTO-1449  
☐ Citations  
☐ Declaration of Biological Deposit  
☐ Submission of "Sequence Listing," computer readable copy and/or amendment pertaining thereto for biotechnology invention containing nucleotide and/or amino acid sequence.  
☐ Authorization of Attorney(s) to Accept and Follow Instructions from Representative  
☐ Special Comments  
☐ Other

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08 227075

08/782866

**PATENT**Docket No. GV-2166**Box Patent Application****Commissioner of Patents and Trademarks****Washington, D.C. 20231****NEW APPLICATION TRANSMITTAL**

Transmitted herewith for filing is the patent application of

Inventor(s): Paul Delabastita, Johan Van Hunsel and  
Frank Schelfaut**WARNING:** Patent must be applied for in the name(s) of all of the actual inventor(s). 37 CFR 1.41(a) and 1.53(b).

For (title): Method For Making A Lithographic Printing Plate

**1. Type of Application**

This new application is for a(n) (check one applicable item below):

- ☒ Original  
☐ Design  
☐ Plant

**WARNING:** Do not use this transmittal for a completion in the U.S. of an International Application under 35 U.S.C. 371(c)(4) unless the International Application is being filed as a divisional, continuation or continuation-in-part application.**NOTE:** If one of the following 3 items apply, then complete and attach ADDED PAGES FOR NEW APPLICATION TRANSMITTAL WHERE BENEFIT OF A PRIOR U.S. APPLICATION CLAIMED and a NOTIFICATION IN PARENT APPLICATION OF THE FILING OF THIS CONTINUATION APPLICATION.

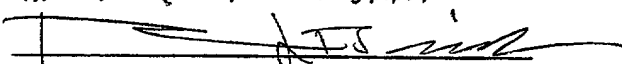
- ☐ Divisional  
☐ Continuation  
☐ Continuation-in-part (CIP)

**CERTIFICATION UNDER 37 CFR 1.10**

I hereby certify that this New Application Transmittal and the documents referred to as enclosed therein are being deposited with the United States Postal Service on this date April 13, 1994 in an envelope as "Express Mail Post Office to Addressee" Mailing Label Number EF413577190 addressed to the: Commissioner of Patents and Trademarks, Washington, D.C. 20231.

Richard J. Birch

(type or print name of person mailing paper)

  
(Signature of person mailing paper)**NOTE:** Each paper or fee referred to as enclosed herein has the number of the "Express Mail" mailing label placed thereon prior to mailing. 37 CFR 1.10(b).

5. Declaration or oath

☒ Enclosed

executed by (check all applicable boxes)

☒ inventor(s).

☐ legal representative of inventor(s). 37 CFR 1.42 or 1.43

☐ joint inventor or person showing a proprietary interest on behalf of inventor who refused to sign or cannot be reached.

☐ this is the petition required by 37 CFR 1.47 and the statement required by 37 CFR 1.47 is also attached. See item 13 below for fee.

☐ Not Enclosed.

WARNING: Where the filing is a completion in the U.S. of an International Application but where a declaration is not available or where the completion of the U.S. application contains subject matter in addition to the International Application the application may be treated as a continuation or continuation-in-part, as the case may be, utilizing ADDED PAGE FOR NEW APPLICATION TRANSMITTAL WHERE BENEFIT OF PRIOR U.S. APPLICATION CLAIMED.

☐ Application is made by a person authorized under 37 CFR 1.41(c) on behalf of all the above named inventor(s). (The declaration or oath, along with the surcharge required by 37 CFR 1.16(e) can be filed subsequently).

NOTE: It is important that all the correct inventor(s) are named for filing under 37 CFR 1.41(c) and 1.53(b).

☐ Showing that the filing is authorized. (Not required unless called into question. 37 CFR 1.41(d).

6. Inventorship Statement

WARNING: If the named inventors are each not the inventors of all the claims an explanation, including the ownership of the various claims at the time the last claimed invention was made, should be submitted.

The inventorship for all the claims in this application are:

☒ The same

or

☐ Are not the same. An explanation, including the ownership of the various claims at the time the last claimed invention was made,

☐ is submitted.

☐ will be submitted.

7. Language

NOTE: An application including a signed oath or declaration may be filed in a language other than English. A verified English translation of the non-English language application and the processing fee of \$130.00 required by 37 CFR 1.17(k) is required to be filed with the application or within such time as may be set by the Office. 37 CFR 1.52(d).

NOTE: A non-English oath or declaration in the form provided or approved by the PTO need not be translated. 37 CFR 1.69(b).

☒ English

☐ non-English

☐ the attached translation is a verified translation. 37 CFR 1.52(d).

**8. Assignment**

☒ An assignment of the invention to AGFA-GEVAERT

☒ is attached. A separate ☒ "COVER SHEET FOR ASSIGNMENT (DOCUMENT) ACCOMPANYING NEW PATENT APPLICATION" or ☐ FORM PTO 1595 is also attached.

☐ will follow.

NOTE: "If an assignment is submitted with a new application, send two separate letters-one for the application and one for the assignment." Notice of May 4, 1990 (1114 O.G. 77-78).

WARNING: A newly executed "CERTIFICATE UNDER 37 CFR 3.73(b)" must be filed when a continuation-in-part application is filed by an assignee. Notice of April 30, 1993, 1150 O.G. 62-64.

**9. Certified Copy**

Certified copy(ies) of application(s)

European	93201115.8	April 16, 1993
(country)	(appln. no.)	(filed)
(country)	(appln. no.)	(filed)
(country)	(appln. no.)	(filed)

from which priority is claimed

☒ is (are) attached.

☐ will follow.

NOTE: The foreign application forming the basis for the claim for priority must be referred to in the oath or declaration. 37 CFR 1.55(a) and 1.63.

NOTE: This item is for any foreign priority for which the application being filed directly relates. If any parent U.S. application or International Application from which this application claims benefit under 35 U.S.C. 120 is itself entitled to priority from a prior foreign application then complete item 18 on the ADDED PAGES FOR NEW APPLICATION TRANSMITTAL WHERE BENEFIT OF PRIOR U.S. APPLICATION(S) CLAIMED.

**10. Fee Calculation (37 CFR 1.16)**

A. ☒ Regular application

CLAIMS AS FILED				
Number filed	Number Extra		Rate	Basic Fee 37 CFR 1.16(a) \$710.00
Total Claims (37 CFR 1.16(c))	7	-20=	0	X \$ 22.00
Independent Claims (37 CFR 1.16(b))	1	-3=	0	X \$ 74.00
Multiple dependent claim(s), if any (37 CFR 1.16(d))			+	\$230.00

☐ Amendment cancelling extra claims enclosed.

☐ Amendment deleting multiple-dependencies enclosed.

☐ Fee for extra claims is not being paid at this time.

NOTE: If the fees for extra claims are not paid on filing they must be paid or the claims cancelled by amendment, prior to the expiration of the time period set for response by the Patent and Trademark Office in any notice of fee deficiency. 37 CFR 1.16(d).

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## Filing Fee Calculation

\$ 710.00

- B. ☐ Design application  
(\$290.00—37 CFR 1.16(f))

## Filing Fee Calculation

\$ \_\_\_\_\_

- C. ☐ Plant application  
(\$480.00—37 CFR 1.16(g))

## Filing fee calculation

\$ \_\_\_\_\_

## 11. Small Entity Statement(s)

- ☐ Verified Statement(s) that this is a filing by a small entity under 37 CFR 1.9 and 1.27 is(are) attached.

Filing Fee Calculation (50% of A, B or C above)

\$ \_\_\_\_\_

NOTE: Any excess of the full fee paid will be refunded if a verified statement and a refund request are filed within 2 months of the date of timely payment of a full fee. 37 CFR 1.28(a).

12. Request for International-Type Search (37 CFR 1.104(d)) *(complete, if applicable)*

- ☐ Please prepare an international-type search report for this application at the time when national examination on the merits takes place.

## 13. Fee Payment Being Made At This Time

- ☐ Not Enclosed

- ☐ No filing fee is to be paid at this time. *(This and the surcharge required by 37 CFR 1.16(e) can be paid subsequently.)*

- ☒ Enclosed

- ☒ basic filing fee

\$ 710.00

- ☒ recording assignment  
(\$40.00; 37 CFR 1.21(h)) (See attached "COVER SHEET FOR ASSIGNMENT ACCOMPANYING NEW APPLICATION".)

- ☐ petition fee for filing by other  
than all the inventors or person  
on behalf of the inventor where  
inventor refused to sign or cannot  
be reached. (\$130.00; 37 CFR  
1.47 and 1.17(h))

\$ \_\_\_\_\_

- ☐ for processing an application with  
a specification in a non-English  
language. (\$130.00; 37 CFR 1.52(d) and  
1.17(k))

\$ \_\_\_\_\_

- ☐ processing and retention fee  
(\$130.00; 37 CFR 1.53(d) and 1.21(l))

- ☐ fee for international-type search report (\$40.00;  
37 CFR 1.21(e)).

\$ \_\_\_\_\_

NOTE: 37 CFR 1.21(l) establishes a fee for processing and retaining any application which is abandoned for failing to complete the application pursuant to 37 CFR 1.53(d) and this, as well as the changes to 37 CFR 1.53 and 1.78, indicate that in order to obtain the benefit of a prior U.S. application, either the basic filing fee must be paid or the processing and retention fee of § 1.21(l) must be paid within 1 year from notification under § 53(d).

Total fees enclosed

\$ 750.00

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**14. Method of Payment of Fees**

- ☒ Check in the amount of \$ 710.00 & 40.00
- ☐ Charge Account No. \_\_\_\_\_ in the amount of \$ \_\_\_\_\_. A duplicate of this transmittal is attached.

*NOTE: Fees should be itemized in such a manner that it is clear for which purpose the fees are paid. 37 CFR 1.22(b).*

**15. Authorization to Charge Additional Fees**

*WARNING: If no fees are to be paid on filing the following items should not be completed.*

*WARNING: Accurately count claims, especially multiple dependent claims, to avoid unexpected high charges, if extra claim charges are authorized.*

- ☒ The Commissioner is hereby authorized to charge the following additional fees by this paper and during the entire pendency of this application to Account No. 02-2445:
- ☒ 37 CFR 1.16(a), (f) or (g) (filing fees)
- ☐ 37 CFR 1.16(b), (c) and (d) (presentation of extra claims)

*NOTE: Because additional fees for excess or multiple dependent claims not paid on filing or on later presentation must only be paid or these claims cancelled by amendment prior to the expiration of the time period set for response by the PTO in any notice of fee deficiency (37 CFR 1.16(d)), it might be best not to authorize the PTO to charge additional claim fees, except possibly when dealing with amendments after final action.*

- ☐ 37 CFR 1.16(e) (surcharge for filing the basic filing fee and/or declaration on a date later than the filing date of the application)
- ☒ 37 CFR 1.17 (application processing fees)

*WARNING: While 37 CFR 1.17(a), (b), (c) and (d) deal with extensions of time under § 1.136(a) this authorization should be made only with the knowledge that: "Submission of the appropriate extension fee under 37 C.F.R. 1.136(a) is to no avail unless a request or petition for extension is filed." (Emphasis added). Notice of November 5, 1985 (1060 O.G. 27).*

- ☐ 37 CFR 1.18 (issue fee at or before mailing of Notice of Allowance, pursuant to 37 CFR 1.311(b))

*NOTE: Where an authorization to charge the issue fee to a deposit account has been filed before the mailing of a Notice of Allowance, the issue fee will be automatically charged to the deposit account at the time of mailing the notice of allowance. 37 CFR 1.311(b).*

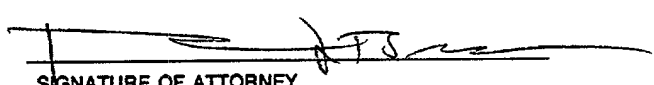
*NOTE: 37 CFR 1.28(b) requires "Notification of any change in loss of entitlement to small entity status must be filed in the application . . . prior to paying, or at the time of paying, . . . issue fee". From the wording of 37 CFR 1.28(b): (a) notification of change of status must be made even if the fee is paid as "other than a small entity" and (b) no notification is required if the change is to another small entity.*

**16. Instructions As To Overpayment**

- ☒ Credit Account No. 02-2445
- ☐ Refund

Reg. No. 20,895

Tel. No. ( 617 ) 237-1819

  
SIGNATURE OF ATTORNEY

Richard J. Birch

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(P.O. Address)  
Wellesley, MA 02181

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1874 1875 1876 1877 1878 1879 1880 1881 1882 1883 1884 1885 1886 1887 1888 1889 1890 1891 1892 1893 1894 1895 1896 1897 1898 1899 1900 1901 1902 1903 1904 1905 1906 1907 1908 1909 1910 1911 1912 1913 1914 1915 1916 1917 1918 1919 1920 1921 1922 1923 1924 1925 1926 1927 1928 1929 1930 1931 1932 1933 1934 1935 1936 1937 1938 1939 1940 1941 1942 1943 1944 1945 1946 1947 1948 1949 1950 1951 1952 1953 1954 1955 1956 1957 1958 1959 1960 1961 1962 1963 1964 1965 1966 1967 1968 1969 1970 1971 1972 1973 1974 1975 1976 1977 1978 1979 1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023 2024 2025 2026 2027 2028 2029 2030 2031 2032 2033 2034 2035 2036 2037 2038 2039 2040 2041 2042 2043 2044 2045 2046 2047 2048 2049 2050 2051 2052 2053 2054 2055 2056 2057 2058 2059 2060 2061 2062 2063 2064 2065 2066 2067 2068 2069 2070 2071 2072 2073 2074 2075 2076 2077 2078 2079 2080 2081 2082 2083 2084 2085 2086 2087 2088 2089 2090 2091 2092 2093 2094 2095 2096 2097 2098 2099 2100 2101 2102 2103 2104 2105 2106 2107 2108 2109 2110 2111 2112 2113 2114 2115 2116 2117 2118 2119 2120 2121 2122 2123 2124 2125 2126 2127 2128 2129 2130 2131 2132 2133 2134 2135 2136 2137 2138 2139 2140 2141 2142 2143 2144 2145 2146 2147 2148 2149 2150 2151 2152 2153 2154 2155 2156 2157 2158 2159 2160 2161 2162 2163 2164 2165 2166 2167 2168 2169 2170 2171 2172 2173 2174 2175 2176 2177 2178 2179 2180 2181 2182 2183 2184 2185 2186 2187 2188 2189 2190 2191 2192 2193 2194 2195 2196 2197 2198 2199 2200 2201 2202 2203 2204 2205 2206 2207 2208 2209 2210 2211 2212 2213 2214 2215 2216 2217 2218 2219 2220 2221 2222 2223 2224 2225 2226 2227 2228 2229 2230 2231 2232 2233 2234 2235 2236 2237 2238 2239 2240 2241 2242 2243 2244 2245 2246 2247 2248 2249 2250 2251 2252 2253 2254 2255 2256 2257 2258 2259 2260 2261 2262 2263 2264 2265 2266 2267 2268 2269 2270 2271 2272 2273 2274 2275 2276 2277 2278 2279 2280 2281 2282 2283 2284 2285 2286 2287 2288 2289 2290 2291 2292 2293 2294 2295 2296 2297 2298 2299 2300 2301 2302 2303 2304 2305 2306 2307 2308 2309 2310 2311 2312 2313 2314 2315 2316 2317 2318 2319 2320 2321 2322 2323 2324 2325 2326 2327 2328 2329 2330 2331 2332 2333 2334 2335 2336 2337 2338 2339 2340 2341 2342 2343 2344 2345 2346 2347 2348 2349 2350 2351 2352 2353 2354 2355 2356 2357 2358 2359 2360 2361 2362 2363 2364 2365 2366 2367 2368 2369 2370 2371 2372 2373 2374 2375 2376 2377 2378 2379 2380 2381 2382 2383 2384 2385 2386 2387 2388 2389 2390 2391 2392 2393 2394 2395 2396 2397 2398 2399 2400 2401 2402 2403 2404 2405 2406 2407 2408 2409 2410 2411 2412 2413 2414 2415 2416 2417 2418 2419 2420 2421 2422 2423 2424 2425 2426 2427 2428 2429 2430 2431 2432 2433 2434 2435 2436 2437 2438 2439 2440 2441 2442 2443 2444 2445 2446 2447 2448 2449 2450 2451 2452 2453 2454 2455 2456 2457 2458 2459 2460 2461 2462 2463 2464 2465 2466 2467 2468 2469 2470 2471 2472 2473 2474 2475 2476 2477 2478 2479 2480 2481 2482 2483 2484 2485 2486 2487 2488 2489 2490 2491 2492 2493 2494 2495 2496 2497 2498 2499 2500 2501 2502 2503 2504 2505 2506 2507 2508 2509 2510 2511 2512 2513 2514 2515 2516 2517 2518 2519 2520 2521 2522 2523 2524 2525 2526 2527 2528 2529 2530 2531 2532 2533 2534 2535 2536 2537 2538 2539 2540 2541 2542 2543 2544 2545 2546 2547 2548 2549 2550 2551 2552 2553 2554 2555 2556 2557 2558 2559 2560 2561 2562 2563 2564 2565 2566 2567 2568 2569 2570 2571 2572 2573 2574 2575 2576 2577 2578 2579 2580 2581 2582 2583 2584 2585 2586 2587 2588 2589 2590 2591 2592 2593 2594 2595 2596 2597 2598 2599 2600 2601 2602 2603 2604 2605 2606 2607 2608 2609 2610 2611 2612 2613 2614 2615 2616 2617 2618 2619 2620 2621 2622 2623 2624 2625 2626 2627 2628 2629 2630 2631 2632 2633 2634 2635 2636 2637 2638 2639 2640 2641 2642 2643 2644 2645 2646 2647 2648 2649 2650 2651 2652 2653 2654 2655 2656 2657 2658 2659 2660 2661 2662 2663 2664 2665 2666 2667 2668 2669 2670 2671 2672 2673 2674 2675 2676 2677 2678 2679 2680 2681 2682 2683 2684 2685 2686 2687 2688 2689 2690 2691 2

☐ Plus Added Pages For New Application Transmittal Where Benefit Of Prior U.S. Application(s) Claimed

☐ Plus Added Pages For Papers Referred To In Item 4 Above☒ Plus "Assignment Cover Letter Accompanying New Application"

☐ **Statement Where No Further Pages Added**

☐ This transmittal ends with this page.

## DESCRIPTION

## 1. Field of the invention.

The present invention relates to a method for making a lithographic printing plate, in particular to a method wherein a lithographic printing plate precursor is scan-wise exposed.

## 2. Background of the invention.

Lithographic printing is the process of printing from specially prepared surfaces, some areas of which are capable of accepting ink (oleophilic areas) whereas other areas will not accept ink (oleophobic areas). The oleophilic areas form the printing areas while the oleophobic areas form the background areas.

Two basic types of lithographic printing plates are known. According to a first type, so called wet printing plates, both water or an aqueous dampening liquid and ink are applied to the plate surface that contains hydrophilic and hydrophobic areas. The hydrophilic areas will be soaked with water or the dampening liquid and are thereby rendered oleophobic while the hydrophobic areas will accept the ink. A second type of lithographic printing plates operates without the use of a dampening liquid and are called driographic printing plates. This type of printing plates comprise highly ink repellant areas and oleophilic areas. Generally the highly ink repellant areas are formed by a silicon layer.

Lithographic printing plates can be prepared using a photosensitive lithographic printing plate precursor, also called imaging element. Such imaging element is exposed in accordance with the image data and is generally developed thereafter so that a differentiation results in ink accepting properties between the exposed and unexposed areas.

Examples of photosensitive lithographic printing plate precursors are for example the silver salt diffusion transfer (hereinafter DTR) materials disclosed in EP-A-410500, EP-A-483415, EP-A-423399, imaging elements having a photosensitive layer containing diazonium salts or a diazo resin as described in e.g. EP-A-450199, imaging elements having a photosensitive layer containing a photopolymerizable composition as described in e.g. EP-A-502562, EP-A-491457, EP-A-503602, EP-A-471483 or DE-A-4102173.

Alternatively a lithographic printing plate may be prepared from



a heat mode recording material as a lithographic printing plate precursor. Upon application of a heat pattern in accordance with image data and optional development the surface of such heat mode recording material may be differentiated in ink accepting and ink repellant areas. The heat pattern may be caused by a direct heating source such as a thermal head but may also be caused by a light source as e.g. a laser. In the latter case the heat mode recording material will include a substance capable of converting the light into heat. Heat mode recording materials that can be used for making a lithographic printing plate precursor are described in e.g. EP-A-92201633, DE-A-2512038, FR-A-1.473.751, Research Disclosure 19201 of April 1980 or Research Disclosure 33303 of <sup>January</sup> ~~January~~ 1992.

From the above it will be clear that lithographic printing is only capable of reproducing two tone values because the areas will accept ~~ink~~ or not. Thus lithographic printing is a so called binary process. In order to reproduce originals having <sup>continuously</sup> ~~continuously~~ changing tone values by such process halftone screening techniques are applied.

In a commonly used halftone screening technique, the continuously changing tone values of the original are modulated with periodically changing tone values of a superimposed two-dimensional screen. The modulated tone values are then subject to a thresholding process wherein tone values above the <sup>threshold</sup> ~~threshold~~ value will be reproduced and those below will not be reproduced. The process of tone-value modulation and thresholding results in a two-dimensional arrangement of equally spaced "screen dots" whose dimensions are proportional to the tone value of the original at that particular location. The number of screen dots per unit distance determines the screen frequency or screen ruling. This screening technique wherein the screen frequency is constant and inversely proportional to the halftone cell size and, hence, to the maximum density of the screen dot, is referred to as amplitude-modulation screening or autotypical screening. This technique can be implemented photo-mechanically or electronically.

The photo-mechanical implementation involves an analog process wherein a screen of equally spaced dots is physically superimposed, in contact or in projection with the original. Screen dots are formed when this combination is photographically reproduced in a system wherein thresholding is achieved through the use of special photographic films and developing chemicals producing a very high photographic contrast resulting a sharp distinction between tone

values above and below a certain level.

The electronic implementation of autotypical screening is a digital process wherein the continuous tone values of the original are broken up into discrete tone-value levels, specified at discrete areal coordinates within the original image. Each tone value is compared with an electronic threshold level, and values above the threshold are reproduced while those below the threshold are not. Screen dots are formed when a specific pattern of threshold values is defined in a two-dimensional array corresponding to the size of a halftone cell, and this threshold pattern is periodically applied across the image.

It will further be clear that in order to reproduce a color image using lithographic printing it will be required to separate the image in three or more part-images corresponding to primary colors that when printed over each other yield the desired color at any place within the image. Each of these color separation has to be screened as described above.

It is well known that the above described procedure of screening and color separation results in certain artifacts on a copy obtained in lithographic printing. Such artifacts are e.g. enlarging of the screen dots on the press, Moiré patterns, color shifts etc.. Due to the complex and critical nature of lithographic printing of continuous tone originals and in particular color <sup>originals</sup> ~~original~~ the need exists for a preview of the final result.

Of course, in order to make such preview one could make a proof print under the same conditions as those intended for the final printing. However such would be very time consuming and expensive. Thus proof printing materials have been developed to simulate the final print including artifacts that are expected to occur in the final print.

Such proofing materials are designed to be used in conjunction with the photographic films also used to make the final printing plates. As a consequence they are only suitable for the proofing of printing plates that are obtained by camera-exposure or contact exposures of imaging elements.

The above proofing materials are generally not suitable for proofing the printing results of plates that are obtained by scan exposure of an imaging element under the control of a computer. Such procedure is called computer-to-plate and obviates the need for photographic films since the image data being in a digital form is used to directly expose the imaging element. The exposure is

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a

carried out by an output device such as e.g. a laser, LED or Cathode Ray Tube, that scans over the imaging element and exposes it according to the digital image data.

Thus for the latter type of printing plates special Direct Digital Proofing (DDP) techniques were developed to generate a printing proof. However because several types of artifacts have to be simulated it can be understood that DDP-techniques include a high degree of sophistication and as a result are expensive.

### 3. Summary of invention.

It is an object of the present invention to provide a method for making a lithographic printing plate by means of scan-exposure of a lithographic printing plate precursor and wherein the printing results can be previewed in a less expensive and convenient way.

Further objects of the present invention will become clear from the description hereinafter.

According to the present invention there is provided a method for making a lithographic printing plate from an original containing continuous tones comprising the steps of:

- screening said original to obtain screened data
- scan-wise exposing a lithographic printing plate precursor according to said screened data, said lithographic printing plate precursor having a surface capable of being differentiated in ink accepting and ink repellant areas upon said scan-wise exposure and an optional development step and
- optionally developing a thus obtained scan-wise exposed lithographic printing plate precursor, characterized in that said screening is a frequency modulation screening.

### 4. Brief description of the drawings.

The present invention is illustrated by way of example and without the intention to limit the invention thereto with the following drawings:

*Fig. 1*  
~~Figure 1 shows a Hilbert curve before (a) and after randomization (b).~~

Figure 2 shows the order of processing image pixels when the image is recursively subdivided into matrices.

Figure 3 shows a schematic representation of a circuit for

5. Detailed description of the invention.

As a consequence of the use of frequency modulation screening for exposing a lithographic printing plate precursor the printing results obtained from such a plate could well be simulated by less expensive, less complex and even relatively low resolution systems (in comparison with lithographic printing). Examples of such systems that can be used for generating a printing proof are ink-jet printers, Xerographic printers and thermal wax printers. It is even possible to use a printing device such as a thermal sublimation printing device that in itself does not require screening to yield a continuous tone image.

The tone value of each image pixel is thereby compared with a threshold value which is generally the tone value half-way the tone scale e.g. 128 when the tones of the image-pixels range from 0 to 256. Depending on whether the tone value of the image pixel is above or below the threshold value a halftone dot will be set or not in the corresponding reproduction of the image pixel. The resulting error or weighted error, i.e. the difference between the reproduction value and actual value of the image pixel, is then added to the tone value of one or more neighbouring image pixels that are still unprocessed. Details about the error diffusion screening method may be found in the aforementioned reference or in US-P-5.175.804.

A more preferred variant of frequency modulation screening for use in connection with the present invention is a method similar to the error diffusion with the exception that the order in which the image pixels are processed can be described by a space filling deterministic fractal curve or a randomized space filling curve.

This type of frequency modulation screening comprises the following steps:

- selecting an unprocessed image pixel according to a space filling deterministic fractal curve or a randomized space filling curve and processing said unprocessed image pixel as follows:
- determining from the tone value of said unprocessed image pixel a reproduction value to be used for recording said image pixel on a lithographic printing plate precursor,
- calculating an error value on the basis of the difference between said tone value of said unprocessed image pixel and said reproduction value, said unprocessed image pixel thereby becoming a processed image pixel,
- adding said error value to the tone value of an unprocessed image pixel and replacing said tone value with the resulting sum or alternatively distributing said error value over two or more unprocessed image pixels by replacing the tone value of each of said unprocessed image pixels to which said error value will be distributed by the sum of the tone value of the unprocessed image pixel and part of said error,
- repeating the above steps until all image pixels are processed.

A suitable deterministic fractal curve is for example the so called "Hilbert Curve" disclosed by Witten Ian H., and Radford M. Neal, "Using Peano Curves for Bilevel Display of Continuous-Tone Images", IEEE CG&A, May 1982, pp. 47-52.

According to the most preferred embodiment of the present invention the order of processing the image pixels is ruled by a randomized space filling curve. With the term "randomized space filling curve" is meant that the processing of the image pixels follows basically a pre-determined curve that assures that each image pixel will be processed but which curve is randomized at a number of points so that patterns are avoided.

Such randomized space filling curve can be obtained in different ways. For example the Hilbert Curve may be used as the pre-determined curve on which randomization is performed. A computer program that can be used to obtain a randomized Hilbert Curve is shown in annex 1. Figure 1 gives a visualization of a Hilbert Curve

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the value of 128, a value "0" is stored in the halftone memory, otherwise a "1" is stored. Block (50) contains an arithmetic unit that is capable to calculate the error between the original contone value, and the halftoned pixel value, and to store it in the delay register (60). Block (8) is a counter that sequences the processing of the  $N \times M$  pixels of the image. Block (10) is LUT with  $N \times M$  entries (one for every image pixel), and a UNIQUE combination of a row and column address that corresponds with one pixel position in the image. Block (5) is a clock.

The table of block (10) thus holds the order in which the image pixels will be processed. This table may be calculated according to one of the methods described above.

The operation of the diagram is now explained. At every clock pulse, the counter (8) is incremented, and a new pair of coordinates  $(i(n), j(n))$  is obtained from block (10). These coordinates are used as address values to the pixel memory (20), to obtain a contone pixel value  $P(i(n), j(n))$ . This pixel value is immediately added to the error  $E(i(n-1), j(n-1))$ , that was stored in register (60) after the previous halftone step, and the sum of both is compared to the threshold value (41) in block (40). The outcome of the thresholding operation determines the value  $H(i(n), j(n))$  that will be written into the halftone pixel memory at position  $(i(n), j(n))$ . At the same time a new error  $E(i(n), j(n))$  is calculated from the difference between  $P(i(n), j(n))$  and  $H(i(n), j(n))$ , and stored in the delay register (60). The circuit is initialized by setting the counter (8) to 1, the error to 128, and the operation is terminated when the counter reaches the level  $N \times M$ . After that, the halftone memory (30) is read out line by line, column by column, and its contents are recorded on a lithographic printing plate precursor by the recorder (80).

According to a variant of the above circuit the error that is obtained from the difference between the contone pixel and the halftoned pixel value, may, instead of being diffused only to the next pixel in the order of processing, diffused to more than one of the unprocessed pixels. Instead of using the error of one pixel, one may also use an average error of a number of pixels.

In case of a color image, the above described screening process is performed on each of the color separations of the image. Preferably the color image is separated in its Yellow, Magenta, Cyan and Black (CMYK) components. Each of these components may then be screened according to the present invention and used to scan-wise

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expose four lithographic printing plate precursors. Four lithographic printing plates, one for each color separation, will thus be obtained. The color separations can then be printed over each other in register in a lithographic printing machine using the four plates.

According to a preferred embodiment of the present invention the CMYK color separations are prepared starting from a device independent representation of the color image. In a device independent color representation each color of an image is uniquely defined by device independent color coordinates within the color spectrum. Such device independent color coordinates are e.g. CIEXYZ or CIEL\*a\*b\*.

From this device independent color coordinates may then be calculated the CMYK separations which are device dependent color signals for controlling a color reproduction device. This conversion is performed in such a way that the reproduction of a color will match the target color as close as possible.

To obtain a device independent color representation of an image a conversion of the device dependent color information obtained from an input device such as a color scanner a similar conversion but in the opposite direction will be necessary.

A method for performing these conversions is disclosed in EP-A-92115339.1. Such method uses conversion tables specific for each particular input or output device to convert the device dependent color image signals into device independent color signals and vice versa.

The method of the present invention can be used with lithographic printing plate precursors having a surface that can be differentiated upon image-wise exposure and an optional development step. Examples of printing plate precursors that can be used in connection with the present invention are printing plate precursors having a photosensitive layer or a heat mode recording layer.

A particular suitable printing plate precursor or imaging element is a so called mono-sheet DTR material. Two variants of such mono-sheet DTR material for making a lithographic printing plate are known and can be used.

A first type of mono-sheet DTR material comprises on a support in the order given a silver halide emulsion layer and an image receiving layer containing physical development nuclei e.g. a heavy metal sulphide as e.g. PdS. The image receiving layer is preferably free of binder or contains a hydrophilic binder in amount of not

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more than 30% by weight. Subsequent to image-wise exposure the mono-sheet DTR material is developed using an alkaline processing liquid in the presence of developing agents e.g. of the hydroquinone type and/or pyrazolidone type and a silver halide solvent such as e.g. a thiocyanate. Subsequently the plate surface is neutralized with a neutralizing liquid. Details about the constitution of this type of mono-sheet DTR material and suitable processing liquids can be found in e.g. EP-A-423399, US-P-4.501.811 and US-P-4.784.933. Lithographic printing plate precursors of this type are marketed by Agfa-Gevaert NV under the name SETPRINT.

These type of printing plate precursors can be exposed using a laser or LED containing device. Examples of HeNe laser containing exposure units are the image-setters LINOTRONIC 300, marketed by LINOTYPE-HELL Co, and Select 5000/7000, marketed by Miles Inc.. An image-setter provided with an Ar ion laser that can be used is LS 210, marketed by Dr-Ing RUDOLF HELL GmbH. Exposure units provided with a laserdiode that can be used are LINOTRONIC 200, marketed by LINOTYPE-HELL Co, and ACCUSET marketed by Miles Inc..

The second type of mono-sheet DTR material also suitable for use in connection with the present invention comprises on an roughened and anodized aluminium support in the order given an image receiving layer as described above, a hydrophilic layer and a silver halide emulsion layer. Subsequent to image-wise exposure the mono-sheet DTR material is developed using an alkaline processing liquid in the presence of developing agents e.g. of the hydroquinone type and/or pyrazolidone type and a silver halide solvent such as e.g. a thiocyanate. Thereafter the plate is rinsed with water, preferably warm water, to remove the silver halide emulsion layer and hydrophilic layer. The obtained silver image in the image receiving may further be treated with a hydrophobizing liquid containing hydrophobizing agents to improve the ink accepting properties of the silver image. Details about the constitution, processing liquid and method for developing the mono-sheet DTR material may be found in EP-A-410500 and EP-A-483415. Because of the stiffness of the aluminium support this type of imaging element is preferably exposed using a flat-bed scanner.

An other type of imaging element suitable for use in connection with the present invention is one comprising on a support having a hydrophilic surface or being coated with a hydrophilic layer a photosensitive layer containing a diazo resin, diazonium salt or a photopolymerizable composition. Such type of printing plate

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precursors are disclosed in EP-A-450199, EP-A-502562, EP-A-487343, EP-A-491457, EP-A-503602, EP-A-471483, DE-A-4102173, Japanese patent application laid open to public inspection number 244050/90 etc.. Subsequent to the exposure these printing plate precursors are developed using plain water, a developing liquid being generally a mixture of water and one or more organic solvents or some of them may be developed using a delamination foil.

An imaging element suitable for use in connection with the present invention and that can be used to yield driographic printing plates is disclosed in e.g. EP-A-475384, EP-A-482653, EP-A-484917 etc..

It is also possible to use imaging elements having a heat mode recording layer. Such heat mode recording layer is a layer containing a substance that is capable of converting light into heat. Examples of heat mode recording layers are e.g. vacuum or vapour deposited Bismuth or Aluminium layers, layers containing infra-red dyes or pigments, layers containing carbon black etc.. Suitable heat mode recording materials for use in connection with the present invention are described in e.g. EP-A-92201633, DE-A-2512038, FR-A-1.473.751, Research Disclosure 19201 of april 1980 or Research Disclosure 33303 of januari 1992.

The latter two heat mode recording materials do not require a developing step or can be developed by simply cleaning the heat mode recording material with e.g. a dry cotton pad.

Suitable devices for scan-wise exposure of a lithographic printing plate precursor are e.g. Cathode Ray Tubes, LED's or lasers. Most preferably used devices are lasers, the particular type of laser and power being dependent on the type of printing plate precursor. Generally a lithographic printing plate precursor based on a silver halide photosensitive layer will require less powerful lasers while heat mode recording materials will generally require powerful lasers.

Examples of lasers that can be used in connection with the present invention are e.g. He/Ne lasers, Argon ion lasers, semiconductor lasers, YAG lasers e.g. Nd-YAG lasers etc..

## CLAIMS

1. A method for making a lithographic printing plate from an original containing continuous tones comprising the steps of:

- screening said original to obtain screened data
- scan-wise exposing a lithographic printing plate precursor according to said screened data, said lithographic printing plate precursor having <sup>on a support</sup> a surface capable of being differentiated in ink accepting and ink repellant areas upon said scan-wise exposure and an optional development step and
- optionally developing a thus obtained scan-wise exposed lithographic printing plate precursor, characterized in that said screening is a frequency modulation screening.

2. A method according to claim 1 wherein said frequency modulation screening proceeds according to the following steps:

- selecting an unprocessed image pixel according to a space filling deterministic fractal curve or a randomized space filling curve and processing said unprocessed image pixel as follows:
- determining from the tone value of said unprocessed image pixel a reproduction value to be used for recording said image pixel on a recording medium,
- calculating an error value on the basis of the difference between said tone value of said unprocessed image pixel and said reproduction value, said unprocessed image pixel thereby becoming a processed image pixel,
- adding said error value to the tone value of an unprocessed image pixel and replacing said tone value with the resulting sum or alternatively distributing said error value over two or more unprocessed image pixels by replacing the tone value of each of said unprocessed image pixels to which said error value will be distributed by the sum of the tone value of the unprocessed image pixel and part of said error,
- repeating the above steps until all image pixels are processed.

3. A method according to claim 2 wherein said original having continuous tones is subdivided in matrices of unprocessed image pixels and all of said image pixels within a matrix is processed before a subsequent matrix is processed.

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- add  $\epsilon'$

## ABSTRACT

## METHOD FOR MAKING A LITHOGRAPHIC PRINTING PLATE.

There is provided a method for making a lithographic printing plate from an original containing continuous tones comprising the steps of:

- screening said original to obtain screened data
- scan-wise exposing a lithographic printing plate precursor according to said screened data, said lithographic printing plate precursor having a surface capable of being differentiated in ink accepting and ink repellant areas upon said scan-wise exposure and an optional development step and
- optionally developing a thus obtained scan-wise exposed lithographic printing plate precursor, characterized in that said screening is a frequency modulation screening. The print results of a thus obtained printing plate can be previewed using simple proofing techniques.

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## Annex 1

```
typedef struct {
    int i;
    int j;
} Index;
```

```
typedef struct {
    Index pt1;
    Index pt2;
    Index pt3;
    Index pt4;
} Hilbert_Elem;
```

```
store_hilbert_elem(it,p)
```

```
    Itile *it;
```

```
    Hilbert_Elem *p;
```

```
{
    static int n=0;
    it->elem[n][0] = p->pt1.i; it->elem[n][1] = p->pt1.j; n++;
    it->elem[n][0] = p->pt2.i; it->elem[n][1] = p->pt2.j; n++;
    it->elem[n][0] = p->pt3.i; it->elem[n][1] = p->pt3.j; n++;
    it->elem[n][0] = p->pt4.i; it->elem[n][1] = p->pt4.j; n++;
}
```

```
/** Initiation for Recursive Calculation of Hilbert Scan ***/
```

```
hilbert_initiation(size,p)
```

```
    int size; Hilbert_Elem *p;
```

```
{
    p->pt1.i = 1*size/4; p->pt1.j = 1*size/4;
    p->pt2.i = 1*size/4; p->pt2.j = 3*size/4;
    p->pt3.i = 3*size/4; p->pt3.j = 3*size/4;
    p->pt4.i = 3*size/4; p->pt4.j = 1*size/4;
}
```

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```
p4.pt2.j = p4.pt1.j-1j;
```

```

    p4.pt3.i = p4.pt2.i-lj;      p4.pt3.j = p4.pt2.j+li;
    p4.pt4.i = p4.pt3.i+li;      p4.pt4.j = p4.pt3.j+lj;
  }
else
  {
    p1.pt1.i = p->pt1.i;          p1.pt1.j = p->pt1.j;
    p1.pt1.i -= (li+lj)/2.0;      p1.pt1.j -= (li+lj)/2.0;
    p1.pt2.i = p1.pt1.i+li;      p1.pt2.j = p1.pt1.j+lj;
    p1.pt3.i = p1.pt2.i-lj;      p1.pt3.j = p1.pt2.j+li;
    p1.pt4.i = p1.pt3.i-li;      p1.pt4.j = p1.pt3.j-lj;

    p2.pt1.i = p1.pt4.i-lj;      p2.pt1.j = p1.pt4.j+li;
    p2.pt2.i = p2.pt1.i-lj;      p2.pt2.j = p2.pt1.j+li;
    p2.pt3.i = p2.pt2.i+li;      p2.pt3.j = p2.pt2.j+lj;
    p2.pt4.i = p2.pt3.i+lj;      p2.pt4.j = p2.pt3.j-li;

    p3.pt1.i = p2.pt4.i+li;      p3.pt1.j = p2.pt4.j+lj;
    p3.pt2.i = p3.pt1.i-lj;      p3.pt2.j = p3.pt1.j+li;
    p3.pt3.i = p3.pt2.i+li;      p3.pt3.j = p3.pt2.j+lj;
    p3.pt4.i = p3.pt3.i+lj;      p3.pt4.j = p3.pt3.j-li;

    p4.pt1.i = p3.pt4.i+lj;      p4.pt1.j = p3.pt4.j-li;
    p4.pt2.i = p4.pt1.i-li;      p4.pt2.j = p4.pt1.j-lj;
    p4.pt3.i = p4.pt2.i+lj;      p4.pt3.j = p4.pt2.j-li;
    p4.pt4.i = p4.pt3.i+li;      p4.pt4.j = p4.pt3.j+lj;
  }

if(l > 1.0)
  { hilbert_propagation(it,&p1);
    hilbert_propagation(it,&p2);
    hilbert_propagation(it,&p3);
    hilbert_propagation(it,&p4); }
else /* termination */
  { store_hilbert_elem(it,&p1);
    store_hilbert_elem(it,&p2);
    store_hilbert_elem(it,&p3);
    store_hilbert_elem(it,&p4);
    return; }
}

```

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## Annex 2

```
permut_2D(seed,n,a)
```

```
    int seed,n,**a;
```

```
    {
```

```
    int i,*b,c[2],d[2];
```

```
    b = (int *) ivector(n*n);
```

```
    ran_perturb(seed,n*n,b);
```

```
    /* replaces the n x n elements in vector b by a random permutation*/
```

```
    c[0]=c[1]=n;
```

```
    for(i=0;i<n*n;i++)
```

```
    {
```

```
        calc_index_from_lin_addr(2,c,b[i],d);
```

```
    /* transforms the linear address b[i] into a coordinate pair in  
    vector d */
```

```
        a[d[0]][d[1]] = i;
```

```
    }
```

```
    free_ivector(b);
```

```
    }
```

```
/** RECURSIVE CALCULATION OF 2D ORDER ***/
```

```
recurs_order_calc(sd,lv,tp,nb,ib,jb,od)
```

```
    int *sd,lv,*tp,nb,ib,jb;
```

```
    ttile *od;
```

```
    {
```

```
    int i,j,**ma,sz,ba;
```

```
    sz = tp[lv];
```

```
    ma = (int **) imatrix(tp[lv],tp[lv]);
```

```
    permut_2D(sd,sz,ma);
```

```
    for(i=0,ba=1;i<lv;i++)
```

```
        ba *= tp[i];
```

```
    if(lv == 0)
```

```
    {
```

```
        for(i=0;i<sz;i++)
```

```
            for(j=0;j<sz;j++)
```

```
            {
```

```
                od->elem[nb+ma[i][j]*ba*ba][0] = ib+i*ba;
```

```
                od->elem[nb+ma[i][j]*ba*ba][1] = jb+j*ba;
```

```
            }
```

```
    return;
```

```
    }
```

```
    for(i=0;i<sz;i++)
```

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```

    for(j=0;j<sz;j++)
    recurs_order_calc(sd,lv-1,tp,nb+ma[i][j]*ba*ba,ib+i*ba,jb+j*ba,od);
    free_imatrix(sz,ma);
}

```

```

main()
{
    char name_path[32];
    int n,seed,level,topol[5]**order;
    int size;
    FILE *fp;
    itile it;

    printf("enter name of path: ");
    scanf("%s",name_path);
    fp = fopen(name_path,"w");
    /* "size" is the size of matrix over which error propagation will
    take place */
    size = 32;
    /* this matrix will be "level" times recursively subdivided into
    subsquares */
    level = 4;
    /* "topol" describes the subsequent size of these submatrices */
    topol[0]=2; topol[1]=2; topol[2]=2; topol[3]=2; topol[4]=2;

    alloc_itile(size*size,2,&it);
    strcpy(it.descr,"cr_path");
    it.nr = size*size;
    it.nc = 2;
    it.min = 0;
    it.max = size;
    seed = -1;
    recurs_order_calc(&seed,level,topol,0,0,0,&it);
    write_itile(fp,&it);
}

```

APPROVED 10.G.FIG.  
PROJECT 9932300 SUBCLASS  
DRAFT CHAS

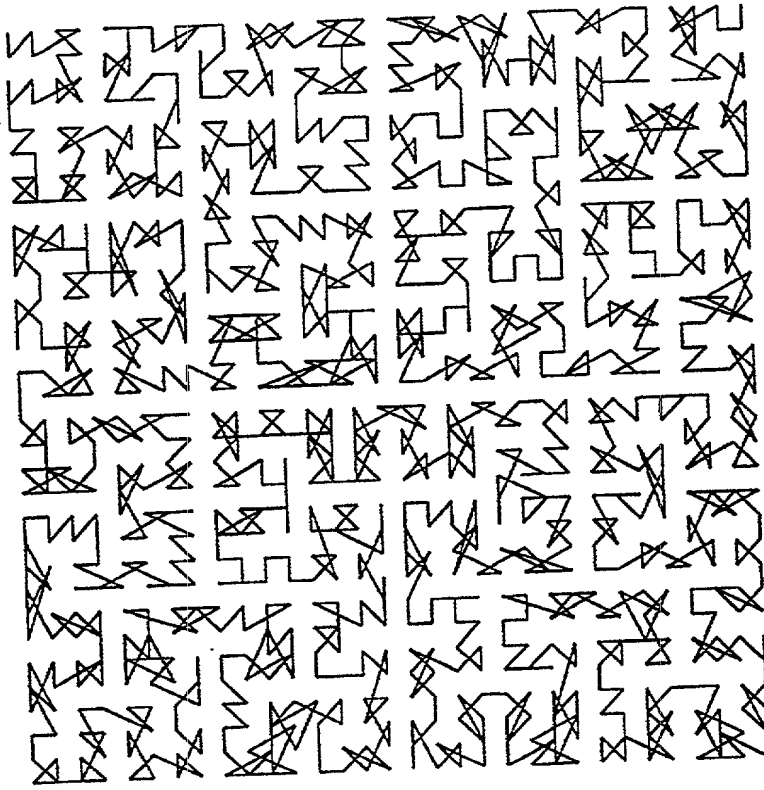


FIGURE 1B

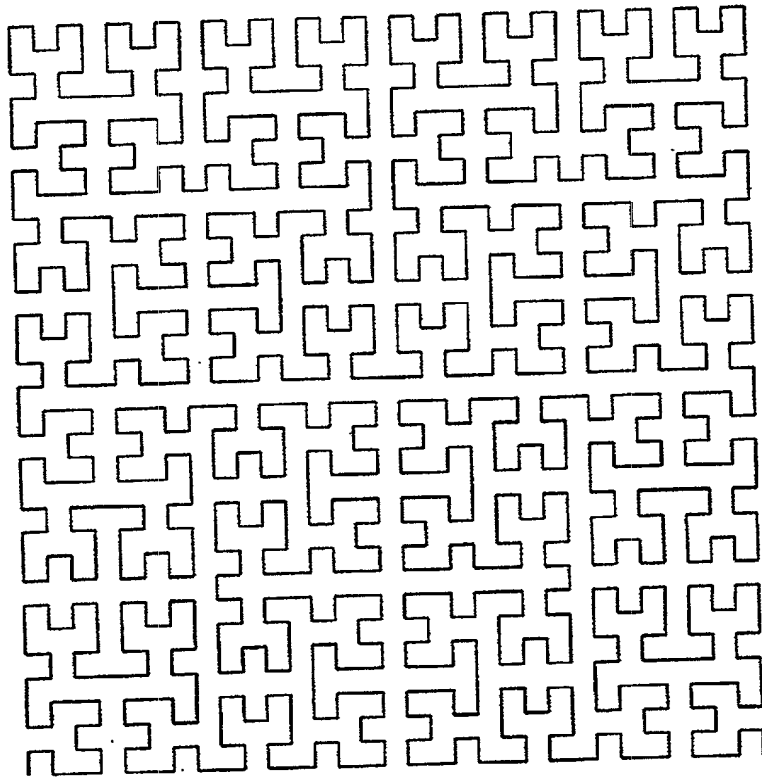


FIGURE 1A



APPROVED 10.G.FIG.  
 253230-1 SUBCLASS  
 DRAFTSMAN

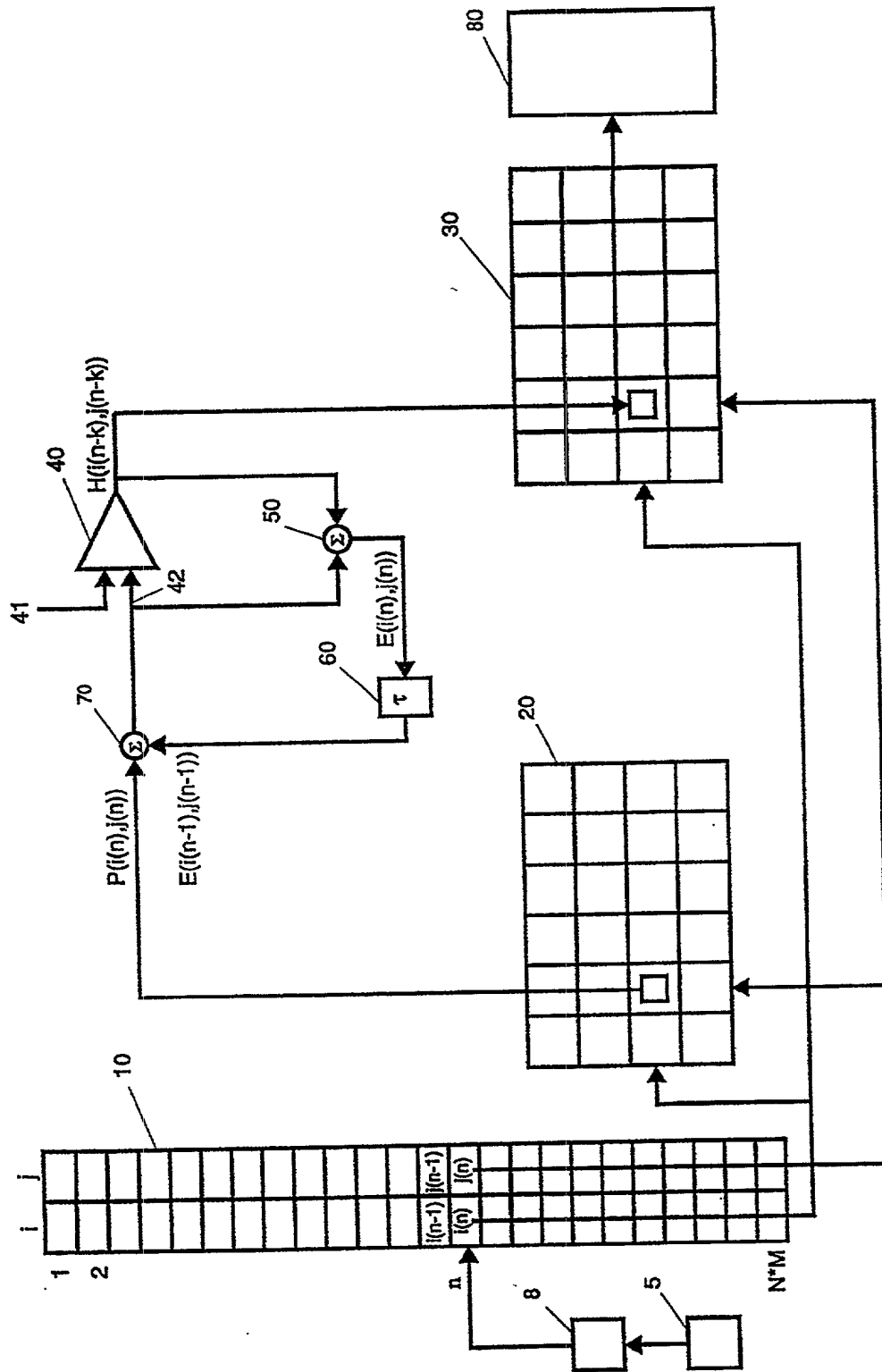


FIGURE 3

DECLARATION and POWER OF ATTORNEY

As a below-named inventor, I hereby declare that :

My residence, post office address and citizenship are as stated below next to my name,

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled : Method for making a lithographic printing plate, the specification of which

[x] is attached hereto.

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims,

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, §1.56,

I hereby claim foreign priority benefits under Title 35, United States Code, §119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

Prior Foreign Application(s) of which Priority is to be claimed :

Application Number : EP 93201115.8

Multilateral Treaty : European  
Patent  
Convention

filing date : April 16, 1993  
receiving office :

designated State : i.a. DE  
European Patent Office  
The Hague/Netherlands

I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith :

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Wellesley, Massachusetts 02181

03763066-01137  
208710-9933280

DECLARATION AND POWER OF ATTORNEY

I hereby declare that all statements made herein of my knowledge are true and that all statements made on information and belief are believed to be true ; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

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